

I CLAIM:

1. An assembly for testing semiconductor devices with a probe station, the probe station having a head stage, the assembly comprising:

5 a first plate configured to be mounted to and completely removable from the head stage of the probe station;

a second plate configured to be removably coupled to the first plate, the second plate having a major aperture for receiving a probe-card assembly and first and second, opposed major surfaces; and

10 docking equipment mounted to the second plate to facilitate docking of a tester to the probe station.

2. The assembly of claim 1, further comprising at least one adjustment mechanism configured to adjust the tilt orientation of the probe-card assembly relative to the head stage.

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3. The assembly of claim 2, wherein the at least one adjustment mechanism comprises an adjusting screw extending through the first plate and bearing against an adjacent surface of the head stage, wherein adjustment of the adjusting screw changes the tilt orientation of the first plate, the second plate, and the probe-card assembly relative to the head stage.

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4. The assembly of claim 1, wherein the docking equipment comprises one or more docking units for mating with corresponding docking units on the tester.

5. The assembly of claim 4, wherein the docking equipment comprises a support member mounted to the second plate and one or more docking units mounted to the support member.

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6. The assembly of claim 1, wherein the second plate comprises a lip portion circumscribing the major aperture for supporting the probe-card assembly.

7. The assembly of claim 6, wherein the lip portion is formed with a plurality of circumferentially spaced bosses, each boss being formed with a threaded hole for receiving a fastener for retaining the probe-card assembly on the lip portion.

8. The assembly of claim 1, wherein:
the head stage defines a head stage major aperture;
the first plate is formed with a first plate major aperture and a recessed portion substantially surrounding the first plate major aperture; and
the second plate is configured to fit within the recessed portion of the first plate such that whenever the second plate is positioned in the recessed portion, the major aperture of the second plate at least partially overlaps the first plate major aperture and the head stage major aperture, thereby allowing a probe card of the probe-card assembly to contact a semiconductor device in the probe station.

9. The assembly of claim 1, further comprising at least one alignment pin extending from one of the first and second plates and a pin hole for receiving the alignment pin formed in the other of the first and second plates, the alignment pin and pin hole facilitating alignment of the second plate relative to the first plate.

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10. The assembly of claim 8, wherein whenever the second plate is positioned in the recessed portion of the first plate, an upper surface of the first plate is generally co-planar with an upper surface of the second plate.

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11. The assembly of claim 1, wherein:
the major aperture of the second plate is dimensioned to receive a probe-card assembly having a first diameter; and
the assembly further comprises a third plate for mounting to the head stage when the first and second plate are not mounted to the head stage, the third plate being
15 completely removable from the head stage and having a major aperture for receiving a probe-card assembly having a second diameter that is larger than the first diameter.

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12. The assembly of claim 11, further comprising docking equipment mounted to the third plate.

13. The assembly of claim 12, wherein the docking equipment mounted to the third plate is different than the docking equipment mounted on the second plate.

14. The assembly of claim 3, wherein the at least one adjustment mechanism further comprises a hold-down screw extending generally co-axially through the adjusting screw and being adapted to tighten into a corresponding hole in the head stage to retain the first plate on the head stage.

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15. A method for testing semiconductor wafers using a probe station having a head stage, the method comprising:

mounting an adapter member to an upper surface of the head stage;

positioning a probe-card assembly in an aperture defined in a docking-equipment-

10 mounting member having docking equipment mounted thereon; and

coupling the docking-equipment-mounting member to the adapter member.

16. The method of claim 15, further comprising:

positioning a semiconductor wafer in the probe station;

15 docking a tester to the first docking equipment; and

testing the semiconductor wafer.

17. The method of claim 16, wherein the docking-equipment-mounting member is a first docking-equipment-mounting member, the probe-card assembly is a

20 first probe-card assembly, the docking equipment comprises first docking equipment, and the method further comprises:

removing the first docking-equipment-mounting member from the adapter member;

coupling a second docking-equipment-mounting member to the adapter member,
the second docking-equipment-mounting member having second docking equipment
mounted thereon, the second docking equipment being different than the first docking
equipment; and

5 positioning a second probe-card assembly in an aperture defined in the second
docking-equipment-mounting member.

18. The method of claim 17, wherein the semiconductor wafer is a first
semiconductor wafer, and wherein the tester is a first tester, and the method further
10 comprises:

positioning a second semiconductor wafer in the probe station;
docking a second tester to the second docking equipment; and
testing the second semiconductor wafer.

15 19. The method of claim 16, wherein the docking-equipment-mounting
member is a first docking-equipment-mounting member, the probe-card assembly is a
first probe-card assembly, the docking equipment comprises first docking equipment, and
the method further comprises:

removing the adapter member and the first docking-equipment-mounting member
20 from the head stage,

mounting a second docking-equipment-mounting member to the upper surface of
the head stage, the second docking-equipment-mounting member having second docking
equipment mounted thereon; and

positioning a second probe-card assembly in an aperture defined in the second docking-equipment-mounting member, the second probe-card assembly having a diameter that is different than the diameter of the first probe-card assembly.

5 20. The method of claim 19, wherein the semi-conductor wafer is a first semiconductor wafer and the tester is a first tester, and the method further comprises:

 positioning a second semiconductor wafer in the probe station;

 docking a second tester to the second docking equipment; and

 testing the second semiconductor wafer.

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 21. The method of claim 20, wherein the second semiconductor wafer is larger than the first semiconductor wafer.

 22. The method of claim 21, wherein the first semiconductor wafer has a
15 nominal diameter of 200 mm and the second semiconductor has a nominal diameter of 300 mm.

 23. The method of claim 15, further comprising adjusting the tilt orientation of the probe-card assembly relative to the head stage to planarize the probe-card assembly
20 relative to a wafer chuck of the probe station.

 24. The method of claim 23, wherein adjusting the tilt orientation of the probe-card assembly comprises adjusting the tilt orientation of the adapter member

relative to the head stage, thereby adjusting the tilt orientation of the docking-equipment-mounting member and the probe-card assembly.

25. The method of claim 23, wherein adjusting the tilt orientation of the
5 probe-card assembly comprises adjusting the tilt orientation of the first docking-equipment-mounting member with respect to the adapter member and the head stage, thereby adjusting the tilt orientation of the probe-card assembly.

26. The method of claim 23, wherein adjusting the tilt orientation of the
10 probe-card assembly comprises rotating an adjusting screw extending through the adapter member and contacting the head stage to cause the adapter member, and therefore the docking-equipment-mounting member and the probe-card assembly, to tilt relative to the head stage.

15 27. The method of claim 15, wherein coupling the docking-equipment-mounting member to the adapter member comprises aligning at least one alignment item on the docking-equipment-mounting member with at least one corresponding alignment item on the adapter member.

20 28. A method for testing semiconductor wafers using a probe station having a head stage, the method comprising:

coupling a probe-card-support device to an upper surface of the head stage;
supporting a probe-card assembly with the probe-card-support device;

positioning a semiconductor wafer in the probe station; and
adjusting the tilt orientation of the probe-card-support device with respect to the
head stage, thereby adjusting the tilt orientation of the probe-card assembly relative to the
wafer to optimize contact between probes of the probe-card assembly and corresponding
5 contacts of the wafer.

29. The method of claim 28, further comprising:
docking a tester to the probe station;
electrically connecting a probe card of the probe-card assembly to the wafer and
10 the tester; and
testing the wafer.

30. The method of claim 28, further comprising:
mounting docking equipment to the probe-card-support device;
15 docking a tester to the docking equipment;
electrically connecting a probe card of the probe-card assembly to the wafer and
the tester; and
testing the wafer.

20 31. The method of claim 28, wherein:
the probe-card-support device comprises a first plate and a second plate nested
within the first plate; and

supporting a probe-card assembly with the probe-card-support device comprises supporting the probe-card assembly within an aperture defined in the second plate.

32. The method of claim 28, further comprising:

5 providing at least one adjusting screw extending through the probe-card-support device and bearing against the head stage; and

wherein adjusting the tilt orientation of the probe-card-support device comprises rotating the adjusting screw to cause the probe-card-support device, and therefore the probe-card assembly, to tilt relative to the head stage.

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33. The method of claim 32, further comprising retaining the probe-card-support device to the head stage by tightening a retaining screw into the head stage, the retaining screw extending through the adjusting screw.

15 34. An apparatus for testing semiconductor wafers with a probe station having a head stage, the apparatus comprising a probe-card-support device for supporting a probe-card assembly when testing a semiconductor wafer with the probe station, the probe-card-support device being configured to be mounted to and completely removable from the head stage, the probe-card-support device being adjustable for adjusting the tilt
20 orientation of the probe-card assembly with respect to the head stage and the semiconductor wafer so as to planarize the probe-card assembly relative to the semiconductor wafer.

35. The apparatus of claim 34, wherein the probe-card-support device comprises a first plate for supporting the probe-card assembly and a second plate for supporting the first plate, the second plate being configured to be mounted to and completely removable from the head stage.

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36. The apparatus of claim 34, further comprising docking equipment mounted to the probe-card-support device, the docking equipment adapted to facilitate docking of a tester to the probe station.

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37. The apparatus of claim 34, further comprising at least one adjustment mechanism for adjusting the tilt orientation of the probe-card assembly, the adjustment mechanism comprising an adjusting screw extending through the probe-card-support device and bearing against an adjacent surface of the head stage such that rotation of the adjusting screw changes the tilt orientation of the probe-card-support device, and therefore the probe-card assembly, relative to the head stage.

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38. The assembly of claim 37, further comprising a retaining screw, the retaining screw extending through the adjusting screw and being adapted to be tightened into the head stage for retaining the probe-card-support device on the head stage.

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39. The assembly of claim 34, wherein the probe-card-support device is supported directly on the head stage.

40. A system for testing semiconductor devices, the system comprising:
a probe station comprising a head stage;
a tester for docking with the probe station during testing of a semiconductor device;

5 an adapter member configured to be mounted to and completely removable from the head stage;

a probe-card-support member configured to be mounted to and completely removable from the adapter member, the probe-card-support member having first and second opposed major surfaces and a major aperture for receiving a probe-card assembly;

10 and

docking equipment mounted to one of the first and second major surfaces of the probe-card-support member, the docking equipment being adapted to facilitate docking of the tester to the probe station.

15 41. The system of claim 40, wherein the docking equipment comprises at least one kinematic docking unit.

42. The system of claim 40, wherein:

the head stage defines a major aperture;

20 the adapter member defines a major aperture; and

wherein whenever the adapter member is mounted to the head stage and the probe-card-support member is mounted to the adapter member, the major aperture of the probe-card-support member at least partially overlaps with the major apertures of the

head stage and adapter member to allow the probe-card assembly to be electrically connected to a semiconductor device in the probe station.

43. An assembly for use in testing semiconductor devices with a probe station
5 having a head stage, the assembly comprising:

an adapter plate configured to be mounted to and completely removable from the head stage of the probe station, the adapter plate having a major aperture and a recessed portion surrounding the major aperture;

- 10 a first probe-card-support plate configured to nest within the recessed portion of the adapter plate, the probe-card-support plate having first and second opposed major surfaces and a major aperture dimensioned to receive a first probe-card assembly adapted to test a first semiconductor wafer;

- 15 a first set of docking equipment mounted to one of the first and second major surfaces of the first probe-card-support plate, the docking equipment being adapted to facilitate docking of a tester to the probe station;

- 20 a plurality of adjustment mechanisms for adjusting the tilt orientation of the first probe-card assembly, each adjustment mechanism comprising an adjusting screw and a hold-down screw, each adjusting screw extending through the adapter plate and bearing against an adjacent surface of the head stage, each hold-down screw extending generally co-axially through a respective adjusting screw into the head stage for retaining the adapter plate on the head stage, wherein when the hold-down screws are loosened to permit movement of the adapter plate relative to the head stage, adjustment of the

adjusting screw changes the tilt orientation of the adapter plate, and therefore the probe-card-support plate and the probe-card assembly, relative to the head stage;

5 a second probe-card-support plate configured to be mountable to and completely removable from the head stage without the use of the adapter plate, the second probe-card-support plate having first and second opposed major surfaces and a major aperture dimensioned to receive a second probe-card assembly adapted to test a second semiconductor wafer, the second semiconductor wafer having a diameter that is greater than the diameter of the first semiconductor wafer; and

10 a second set of docking equipment mounted to one of the first and second major surfaces of the second probe-card-support plate, the docking equipment being adapted to facilitate docking of a tester to the probe station.